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Teaching sarcasm: Evaluating metapragmatic training for typically-developing children

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Abstract

Sarcasm is a common form of social language but one that can be challenging for children to understand. We investigated whether training can enhance children's ability to understand sarcasm. Participants were 111 five- to six- year-olds, assigned to either the training or control condition. In both conditions, children were first shown a series of puppet shows. Each puppet show ended with a sarcastic or literal remark. After each show children were asked about speaker belief, intent, and humour. Children's responses were used to estimate their pre-training sarcasm understanding. In the training condition, children were taught what sarcasm was and what cues to look for as they interacted with the researcher over a set of stories where characters made either sarcastic or literal remarks. In the control condition children read a non-sarcastic storybook with the researcher. Children's understanding of sarcasm was then re-assessed using another series of puppet shows. For children who were not already proficient in sarcasm understanding, training was associated with more accurate speaker belief and intent responses and more accurate sarcasm detection. Training was not related to children's speaker humour responses. Thus, the findings of the present study provide evidence that aspects of children's sarcasm understanding can be enhanced through training. The training paradigm could be developed further to test its effectiveness in other populations who struggle with sarcasm understanding, and to help refine theories of irony development.

Impact Statement

Children often find it hard to understand the meaning of sarcastic speech. The results of this study show that children's sarcasm detection can be improved with a single training session. This suggests that social learning and experience are important to children's ability to understand sarcasm.

Introduction

Sarcasm is a form of verbal irony which involves opposition between the verbal statement and the nonliteral meaning. Sarcastic remarks are intended to be both critical and funny (Roberts & Kreuz, 1994). Most typically developing children find sarcasm quite challenging to comprehend. They only begin to understand sarcasm (e.g. knowing that the speaker means the opposite of what they have said) around age 5 or 6 (Ackerman, 1982; Hancock, Dunham, & Purdy, 2000). It takes much longer, until at least age 8 or 9, for children to understand that sarcasm is intended as humour (Dews et al., 1996; Harris & Pexman, 2003). Previous studies have found that multiple linguistic, cognitive, and social factors are associated with children's sarcasm understanding. Those previous studies have largely been correlational. A training paradigm could afford new insights and help to disentangle some of these associated factors. The purpose of the present study was to test the potential for a single training session to enhance children's understanding of sarcasm.

Development of Sarcasm Comprehension

Sarcasm comprehension is relatively slow to develop compared to other language skills. There are several proposals about why sarcasm is particularly challenging. One proposal is that sarcasm comprehension depends on advanced theory of mind (TOM) skills (e.g., understanding

what Person A thinks that Person B thinks; Happé, 1993). Advanced TOM does not typically develop until after age 5 or 6. To detect sarcasm, a listener needs to understand what the speaker actually believes and also what the speaker wants the listener to believe (Winner & Leekam, 1991). Several other factors are proposed to be important for understanding sarcasm. These include empathy and emotion recognition (Nicholson, Whalen, & Pexman, 2013) and a capacity to attend to and use contextually relevant information to decode speaker intentions (Loukusa, Mäkinen, Gabbatore, Laukkanen-Nevala, & Leinonen, 2017). In addition, language skills have been proposed to be important since these help children engage in conversations and thus gain experience decoding communicative intentions (Angeleri & Airenti, 2014). As Katz has noted (e.g., Katz, Blasko & Kazmerski, 2004), understanding sarcasm depends on understanding both a discourse context and a social context. Similarly, Pexman and Glenwright (2007) argued that children need to have social experiences with sarcasm to develop a mental category for this kind of speech. Pexman, Zdrzilova, McConnachie, Deater-Deckard, and Petrill (2009) found that parents who frequently used irony (including sarcasm) were more likely to have children who used irony. The authors suggested that exposure to parent irony may provide children with opportunities for mimicry and for experimenting with their own irony. Thus, social experience and interactions with peers or family members may play a critical role in developing sarcasm appreciation.

Children's appreciation of sarcasm seems to depend on their mental state inferencing and emotion recognition skills and also their metapragmatic awareness. Metapragmatic awareness is knowledge of the particular uses, purpose, and associated cues for a type of language (Wilkinson & Milosky, 1987). The constraint-based account of verbal irony (Katz, 2004; Pexman, 2008) proposes that comprehenders consider multiple cues to sarcastic intent in order to derive an

interpretation of the speaker's nonliteral meaning. Children must track the many cues to sarcastic intent and combine these to understand the speaker's nonliteral meaning (Whalen, Doyle, & Pexman, 2020). Sarcasm can be cued by the contrast between what a speaker has said and the context in which the comment was made (Colston, 2002; Ivanko & Pexman, 2003). Sarcasm also tends to be associated with a different tone of voice (Bryant & Fox Tree, 2005). For instance, Cutler (1976) described sarcastic remarks as slower, more nasal, and lower in pitch.

Sarcasm Training

To our knowledge, only one previous study has examined sarcasm training for typically developing children. Szűcs and Babarczy (2017) found that children's sarcasm understanding was enhanced by metapragmatic awareness training. Szűcs and Babarczy conducted a study with 39 typically developing Hungarian-speaking children, aged 4-7, who had scored at chance or below on a sarcasm comprehension test. Half of the participants were given three training sessions aimed at enhancing their metapragmatic knowledge. Training was distributed over about a 10-day period. During each training session, participants were presented with stories that took the same form as the stories presented on the sarcasm comprehension test. The stories were presented with explanations of the events and the corresponding statements. Children were asked leading questions to gauge their understanding. After training, all participants were tested again on the same sarcasm task used at pretest. Children who received training scored higher than did the participants in the control group. The authors concluded that children could be trained to appreciate sarcastic language if they were given explicit instruction about the associated metalinguistic rules.

The Present Study

The purpose of the present study was to test the efficacy of a *single* training session for

children's sarcasm comprehension and to assess transfer of training to novel exemplars. The present training emphasized metapragmatic awareness of sarcasm. Children were encouraged to tune into what was said and also how it was said to detect cues to sarcastic intent (voice intonation, humor, etc.). Before training (Time 1), we assessed children's sarcasm comprehension by measuring their responses to a series of puppet shows. This puppet show methodology is similar to that used in many previous studies of sarcasm development (e.g., Harris & Pexman, 2003; Nicholson et al., 2013; Pexman & Glenwright, 2007; Whalen et al., 2020). We expected variability in children's pre-training sarcasm comprehension, consistent with the findings of previous studies (e.g., Loukusa & Leinonen, 2008; Szűcs & Babarczy, 2017). Following training (Time 2) we tested for transfer of training with a different set of puppet shows. We expected that if training was effective then the training group would outperform the control group on accuracy of puppet show interpretation at Time 2.

Method

Participants

Participants were 111 typically developing children (47 males and 64 females) between the ages of five and six years ($M = 70.8$ months, $SD = 6.6$). We quasi-randomly assigned children to the training ($n = 58$) or control ($n = 53$) conditions. Assignment to conditions was constrained by efforts to achieve gender balance across conditions. The training condition included 25 males and 33 females with a mean age of 69 months ($M = 69.1$, $SD = 6.3$). The control condition included 22 males and 31 females with a mean age of 73 months ($M = 72.7$, $SD = 6.4$). All children were recruited from a participant database managed by the ChiLD research group at the University of Calgary. All participants spoke English as their primary language. Participant characteristics are summarized in Table 1.

Procedure and Materials

Training Condition. Participants were asked to attend a one-time lab visit involving three phases: pre-training puppet shows (Time 1), training storybook, and post-training puppet shows (Time 2). At Time 1 we assessed sarcasm understanding using five puppet shows. At Time 2 we assessed sarcasm understanding using another five puppet shows.

Time 1. Participants were first trained on how to use two different Likert scales (Figure 1). These measured perceptions of speaker intent (the Nice/Mean scale) and speaker humour (the Funny/Serious scale). Children were given three practice questions for both scales before assessment began (e.g. “Philip stole Brenda’s lunch. Can you point to a face to show me how nice or mean Philip was being?”).

Next, five puppet shows were presented to each child. Each puppet show contained a literal or sarcastic remark (see <https://osf.io/fe8p9/>). The order of puppet show type was sarcastic, literal, literal, sarcastic, and sarcastic. The narratives for each show were pre-recorded and presented through a laptop speaker. In keeping with the practice of previous sarcasm development studies (e.g., Dews et al., 1996; Harris & Pexman, 2003) children were asked questions after each show about speaker belief, speaker intent, and speaker humour. The speaker belief question was asked to evaluate whether children understood that the speaker puppet held a belief that was counterfactual to their statement (e.g. when Sally said, “you’re a great skier”, did she think that Sylvia was a good or bad skier?). The speaker intent question was asked to evaluate children’s accuracy in detecting whether the speaker puppet meant their comment as a criticism or a compliment. Children responded to the speaker intent question using the Nice/Mean scale (e.g. when Sally said, “you’re a great skier”, can you show me how nice or mean Sally was being?). The speaker humour question was asked to assess children’s accuracy

in perception of speaker humour. Children responded to the speaker humour question using the Funny/Serious scale (e.g. when Sally said, “you’re a great skier”, can you show me how funny or serious Sally was being?”).

Training Storybook. Next, participants were shown a storybook containing seven short stories. The stories were devised for this study. All stories were narrated by the researcher (see Supplementary Materials and <https://osf.io/fe8p9/> for full description of training) and each was illustrated with three colour panels. In each story, a speaker made a literal or sarcastic remark. Before reading the first story, the researcher gave each child a definition of sarcasm. Next, the experimenter read the first story to the child and provided an explanation of specific cues and functions that are associated with sarcasm: 1) Contrast; the researcher pointed out what the character said and what actually happened in the story, emphasizing the contrast in sarcastic remarks. 2) Humour; the researcher emphasized that the character was making a joke with a sarcastic comment. 3) Tone of voice; the researcher used and noted differences in the voicing of sarcastic language. Depending on the accuracy of the child’s responses the researcher faded the amount of explanation given following each story. That is, across stories the researcher gradually shifted from explanation to leading questions. The leading questions were used to keep the child engaged throughout the stories and to gauge their progress in sarcasm comprehension. After the seven stories had been read, all children were given a short verbal summary of cues.

Time 2. Immediately following the training session children were presented with five new puppet shows. In this phase, children were asked an additional (fourth) question assessing their accuracy in judging whether the speaker was being sarcastic or not sarcastic (e.g., When Ethan said, “You’re a fantastic artist”, was he being sarcastic or not sarcastic?”). All sessions were video recorded for future coding purposes.

Control condition. The control condition procedure was the same as in the training condition except that the training storybook was replaced with a control storybook. The researcher read a non-sarcastic storybook aloud to the children: “The Little House” by Virginia Lee Burton. The time required to read the control storybook was equivalent to the time required for training in the training condition (11 minutes).

Children’s Communication Checklist-2

While children participated in the procedure described above, parents were asked to complete the Children’s Communication Checklist-2 (CCC2, Bishop, 2006). This caregiver-report measure is comprised of 70 items and is designed to assess children’s communication difficulties and pragmatic language skills.

Results

All data for this study are available at: <https://osf.io/fe8p9/>. As expected, children showed considerable variability in their Time 1 sarcasm comprehension accuracy. For speaker belief and intent responses at Time 1 some children showed high levels of accuracy, suggesting strong existing sarcasm comprehension skills. Other children had much lower accuracy, suggesting potential for training. Almost all children tended to rate sarcastic remarks on the “serious” end of the face scale at Time 1. Thus there was little evidence that the humour function was mastered in this age group (consistent with the previous literature, e.g., Harris & Pexman, 2003). We used children’s Time 1 responses to distinguish high from low performers. Performance was captured by accuracy of their combined speaker belief and intent responses. We established performance based on a combination of speaker belief and intent performance because one must consider children’s responses on *both* of these questions to be sure that they have not interpreted the statements as white lies or mistakes. Thus, high performers had perfect Time 1 speaker belief

accuracy and mean Time 1 speaker intent ratings above the mid-point of the mean/nice scale, or 2/3 correct speaker belief accuracy and mean Time 1 speaker intent ratings above 5 ($n = 22$ for the training group and $n = 24$ for the control group). We expected that only those children who had less proficient sarcasm comprehension at Time 1 (low performers: $n = 36$ for the training group and $n = 29$ for the control group) could show improvement after training. Thus, only the data from this group were analyzed further.

We examined correlations between all response measures. Children's language skills (as measured with CCC2 scores) were not strongly related to their sarcasm comprehension skills. The only exception was that children in the training condition who had higher CCC2 Total and CCC2 Pragmatic scores tended to rate sarcastic remarks as funnier. This was evident in the correlations before ($r = .40, p < .05$; $r = .38, p < .05$) and after ($r = .42, p < .05$; $r = .40, p < .05$) training.

Next, data were analyzed using logistic (for speaker belief and sarcasm responses) and linear (for speaker intent and humour face scale ratings) mixed effects models. We performed our analyses in R [3.5.1] (R Core Team, 2016).¹ We developed each model's random effects structure using the approach suggested by Bates, Kliegl, Vasishth, and Baayen (2015).

Speaker Belief

In all of the following reporting of results, only low Time 1 performers were considered. The values in Table 1 show that before training, accuracy of children's speaker belief judgments was very similar in the training ($M = 40.74, SD = 29.93$) and control conditions ($M = 34.48, SD = 22.68$). However, following training, children in the training condition were a great deal more

¹ Our analyses used the packages "lme4" [version 1.1-18-1] (Bates, Maechler, Bolker, & Walker, 2015), "afex" [0.23-0] (Singmann, Bolker, & Westfall, 2015), "prediction" [0.3.6] (Leeper, Ganz, & Arel-Bundock, 2019), "RePsychLing" [0.0.4] (Baayen, Bates, Kliegl, & Vasishth, 2015) and "lmerTest" package [3.0-1] (Kuznetsova, Brockhoff, & Christiansen, 2019).

accurate ($M = 50.93$, $SD = 42.53$) than those in the control condition ($M = 20.69$, $SD = 32.63$).

This suggests that children's ability to judge speaker belief improved with training. These observations were confirmed by an analysis which found a significant interaction between time and condition ($b = 0.39$, 95% CI = [0.11, 0.66], $p = .006$), and follow up analyses demonstrating no significant difference between training and control conditions at Time 1 ($b = 0.17$, 95% CI = [-0.18, 0.53], $p = .34$), but a significant difference at Time 2 ($b = 1.60$, 95% CI = [0.45, 2.74], $p = .006$). Tables containing model information for each analysis can be found at

<https://osf.io/fe8p9/>.

Speaker Intent

The values in Table 1 also show that before training, children's speaker intent ratings were very similar in the training ($M = 2.82$, $SD = 1.33$) and control conditions ($M = 2.85$, $SD = 1.00$). However, following training, children in the training condition rated speaker intent as meaner ($M = 3.37$, $SD = 1.95$) than did children in the control condition ($M = 2.07$, $SD = 1.49$). This suggests that children's ability to judge speaker intent for sarcasm improved with training. These observations were confirmed by an analysis which found a significant interaction between time and condition ($b = 0.34$, 95% CI = [0.14, 0.53], $p = .001$), and follow up analyses demonstrating no significant difference between training and control conditions at Time 1 ($b = -0.01$, 95% CI = [-0.31, 0.28], $p = .93$), but a significant difference at Time 2 ($b = 0.66$, 95% CI = [0.22, 1.09], $p = .004$).

Speaker Humour

The values in Table 1 also show that before training children's speaker humour ratings were very similar in the training ($M = 3.59$, $SD = 1.70$) and control conditions ($M = 4.08$, $SD = 1.38$). Children's ratings of speaker humour remained very similar following training ($M = 3.53$,

$SD = 1.98$; and $M = 3.99$, $SD = 1.85$; respectively). These observations were confirmed by an analysis which found no significant interaction between time and condition ($b = 0.01$, 95% CI = $[-0.15, 0.17]$, $p = .87$). This suggests that children's ability to judge speaker humour did not improve with training.

Speaker Sarcasm

The values in Table 1 also reveal that after training children's speaker sarcasm judgments were more accurate in the training condition ($M = 67.50$, $SD = 28.52$) than in the control condition ($M = 50.51$, $SD = 24.07$). This was confirmed by an analysis which found an effect of training condition ($b = 0.41$, 95% CI = $[0.10, 0.73]$, $p = .009$). This suggests that children's ability to detect sarcasm improved with training.

Discussion

The purpose of the present study was to test the possibility that a single metapragmatic training session might be associated with better sarcasm understanding in typically developing children. We provided children in the training condition with metapragmatic information to help them build a mental category for sarcastic speech. We measured training effects on a transfer task with novel sarcastic exemplars. Results showed that children who were not already proficient at sarcasm understanding and who received the training had more accurate detection of sarcasm, speaker belief, and speaker intent at Time 2 (post-training) than did children in the control condition.

The Challenge of Sarcastic Humour

Children in this age group did not accurately detect the humour intended in sarcastic remarks. This finding is consistent with the results of previous studies with 5- to 6-year-olds (Harris & Pexman, 2003; Whalen et al., 2020). One explanation is that children struggle to see

the speaker's humorous intent because they tend to identify with the targets (rather than the speakers) of sarcastic remarks (Pexman, Glenwright, Krol, & James, 2005). As a result they tend to focus more on the criticism than the intended humour in sarcasm. Socha and Kelly (1994) documented the kinds of humour produced by children between the ages of 4 and 13 and found that early jokes tended to be more prosocial. Teasing and antisocial humour emerged later at around 9 years of age. Thus, sarcastic humour may not be consistent with children's conceptions of "funny" before about age 9. Further, to detect the humour function in sarcastic language children need to recognize that the speaker intends to be simultaneously critical and humorous. As such, they must recognize and represent conflicting emotions. Research suggests that this aspect of emotional development is typically observed at about age 10 (e.g., Bennett & Hiscock, 1993). In the present study these tendencies could not be overcome with training.

Limitations and Future Directions

Certainly, there are limitations to the present study. We tested only immediate transfer. The longer-term effects of training will need to be investigated in future research. Nonetheless, the present results are promising. Consistent with previous studies (e.g., Loukusa & Leinonen, 2008; Szűcs & Babarczy, 2017), we found considerable variability in children's understanding of sarcastic speakers' belief and intent. The novel contribution of our study is the demonstration that there is strong potential to address these differences with a single training session.

In addition, this type of training could be developed for use with other populations that tend to struggle with sarcasm (see also Pexman, Reggin, & Lee, 2019). Training could be effective for second-language learners and individuals with a diagnosis of autism spectrum disorder. We also think this training paradigm could be used to further investigate the factors that support children's sarcasm comprehension. For instance, the training paradigm could be

modified to test the role of TOM in sarcasm understanding, through TOM-focused training. Indeed, there is evidence that TOM training can be effective in this age group (e.g., Slaughter & Gopnik, 1996), but to our knowledge the impact of that training on sarcasm understanding has not yet been tested.

Katz argued that sarcasm depends on multiple cues, many of which involve social knowledge. Our results demonstrate the effectiveness of explicit metapragmatic training and thus point to the importance of social learning and experience for development of sarcasm comprehension.

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Table 1

Participant characteristics and response measures as a function of performance group and training condition (standard deviations in parentheses)

Measure	Low T1 Performers		High T1 Performers	
	Control	Training	Control	Training
<i>n</i>	29	36	24	22
Age in months	73.10 (6.01)	68.42 (6.22)	72.21 (6.98)	70.23 (6.37)
% Female	55	58	62	55
CCC2				
Total	36.24 (18.88)	41.26 (23.74)	36.39 (22.32)	37.33 (19.79)
Pragmatic	18.38 (11.64)	18.76 (10.80)	18.17 (11.69)	15.55 (8.76)
Speaker belief accuracy				
T1	34.48 (22.68)	40.74 (29.93)	94.44 (12.69)	93.94 (13.16)
T2	20.69 (32.63)	50.93 (42.53)	81.94 (25.97)	87.88 (21.93)
Speaker intent rating				
T1	2.85 (1.00)	2.82 (1.33)	5.22 (0.83)	5.39 (0.83)
T2	2.07 (1.49)	3.37 (1.95)	4.71 (1.29)	5.20 (1.19)
Speaker humour rating				
T1	4.08 (1.38)	3.59 (1.70)	3.65 (2.07)	4.06 (1.82)
T2	3.99 (1.85)	3.53 (1.98)	3.57 (1.86)	4.05 (1.92)
Sarcasm detection accuracy				
T2	50.51 (24.07)	67.50 (28.52)	53.33 (24.79)	64.55 (23.03)

Note. CCC2 = Children's Communication Checklist-2 (Bishop, 2006); T1 = Time 1; T2 = Time

2. Means and standard deviations calculated on participant means.

Figure 1. Upper panel: Nice/Mean Scale for speaker intent ratings, ranging from 1 = *very nice*, 2 = *nice*, 3 = *a little nice*, 4 = *a little mean*, 5 = *mean*, and 6 = *very mean*. Lower panel: Funny/Serious Scale for speaker humor ratings, ranging from 1 = *very funny*, 2 = *funny*, 3 = *a little funny*, 4 = *a little serious*, 5 = *serious*, and 6 = *very serious*.